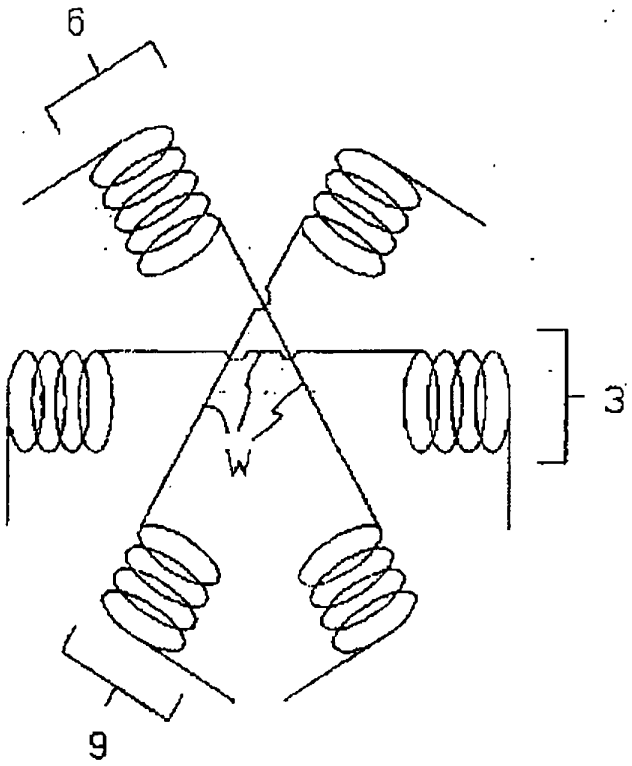


FIG 1
PRIOR ART

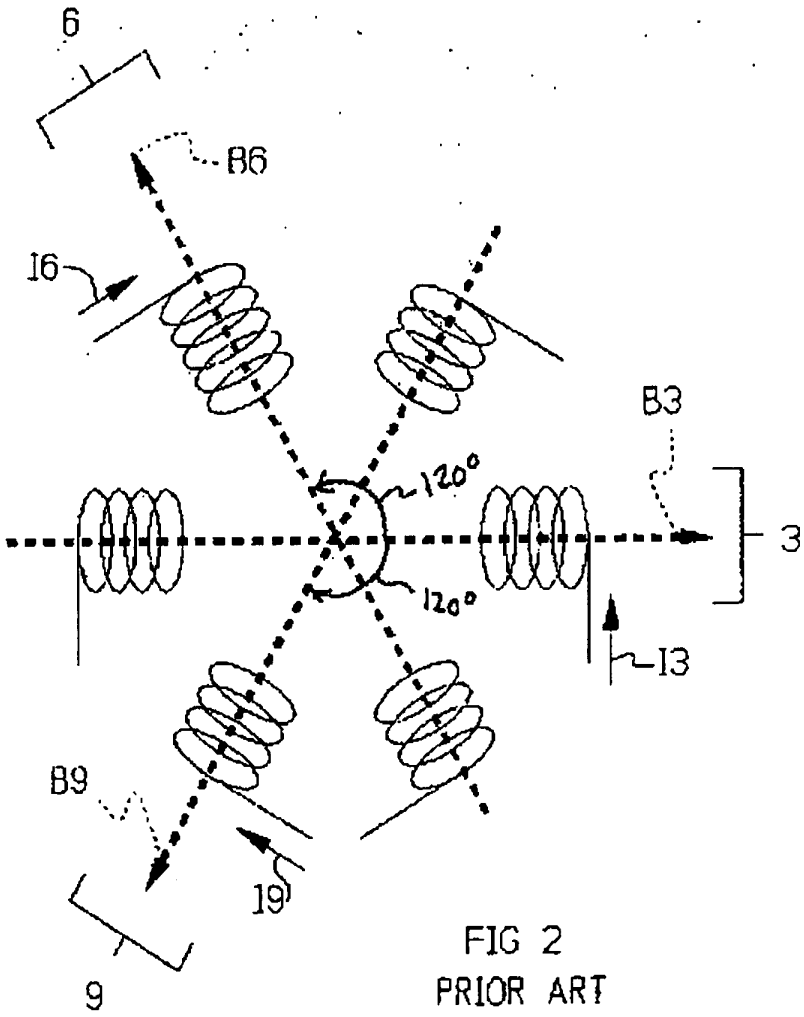


FIG 2
PRIOR ART

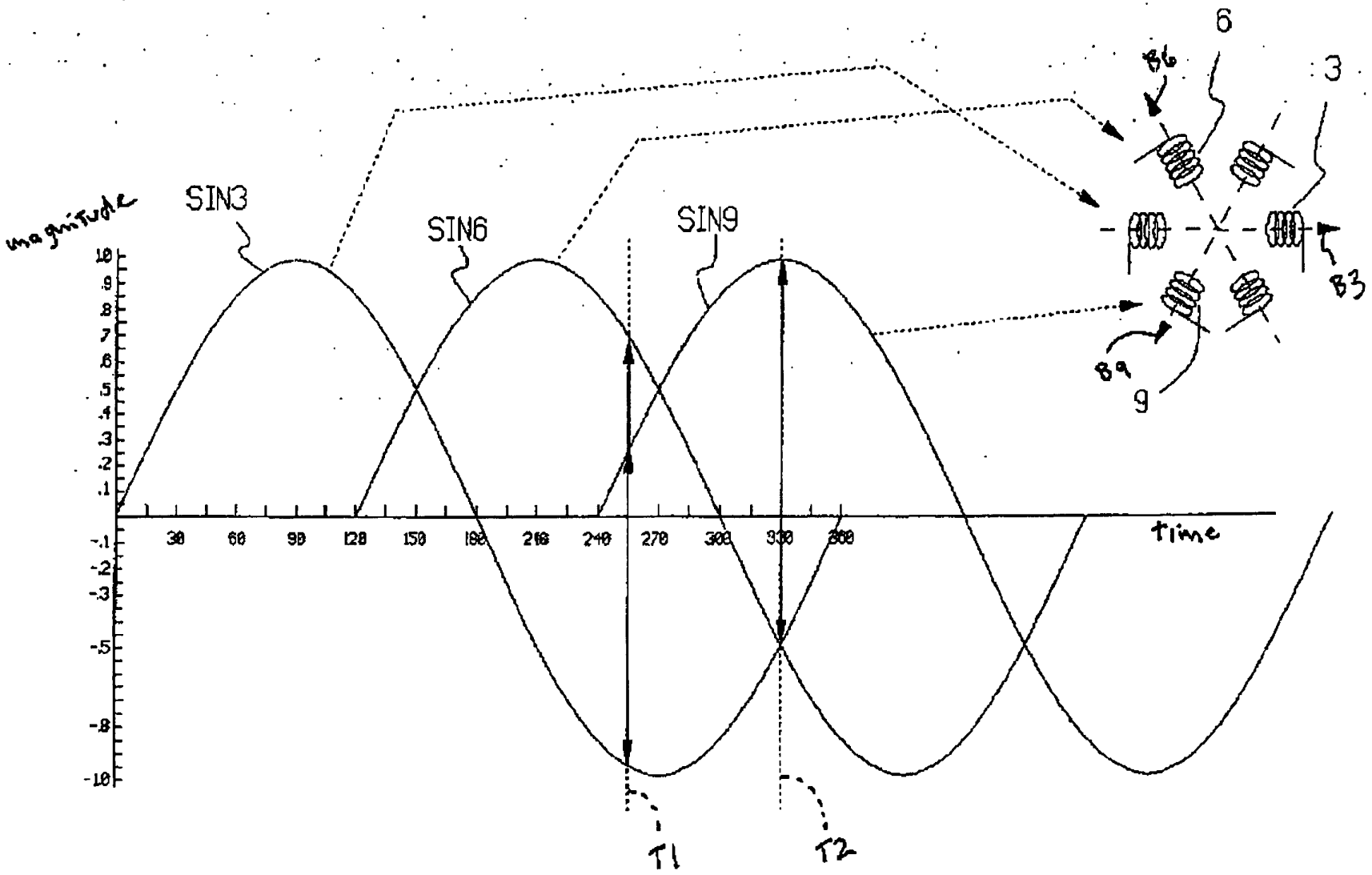


FIG 3 PRIOR ART

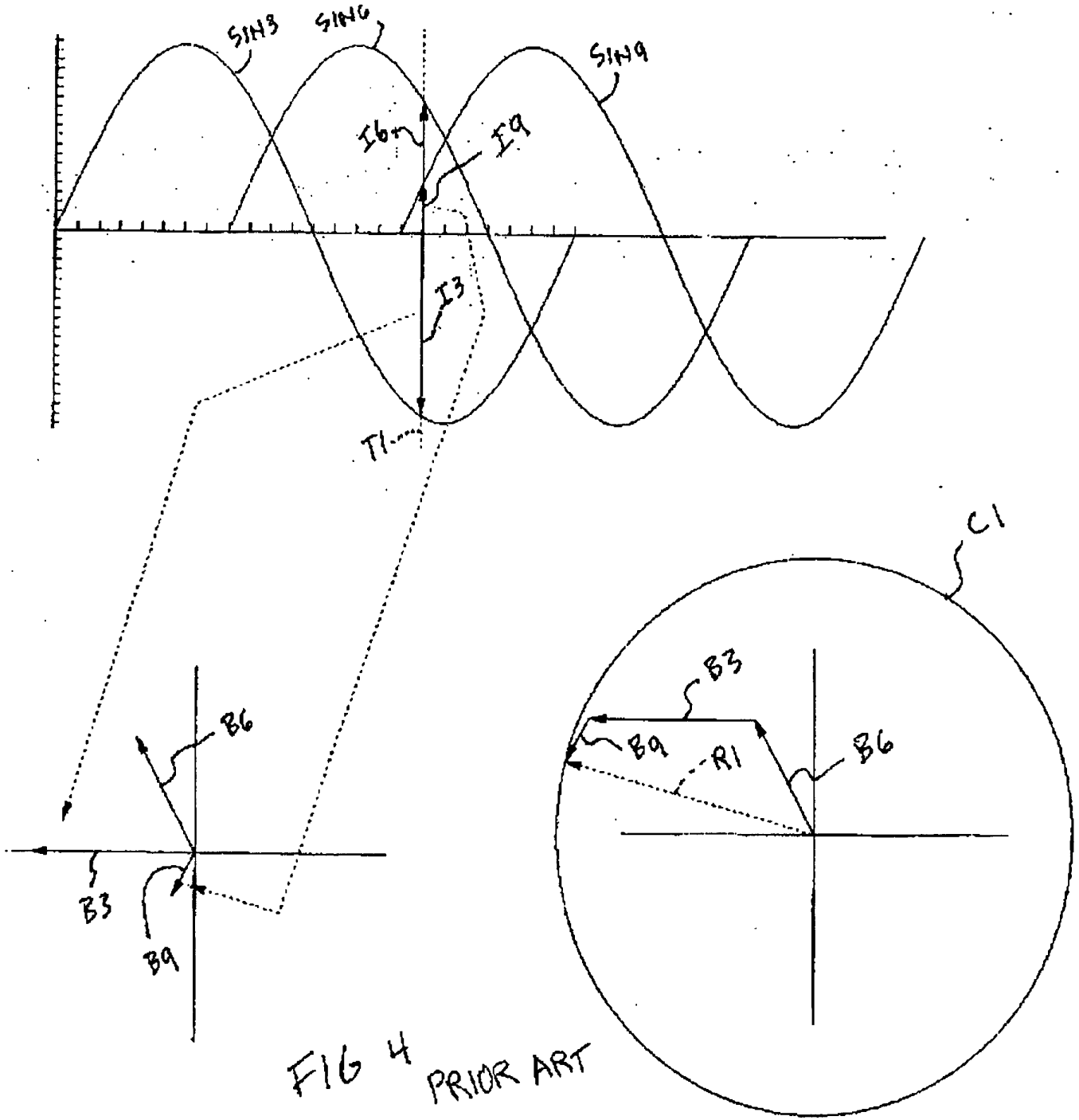


FIG 4 PRIOR ART

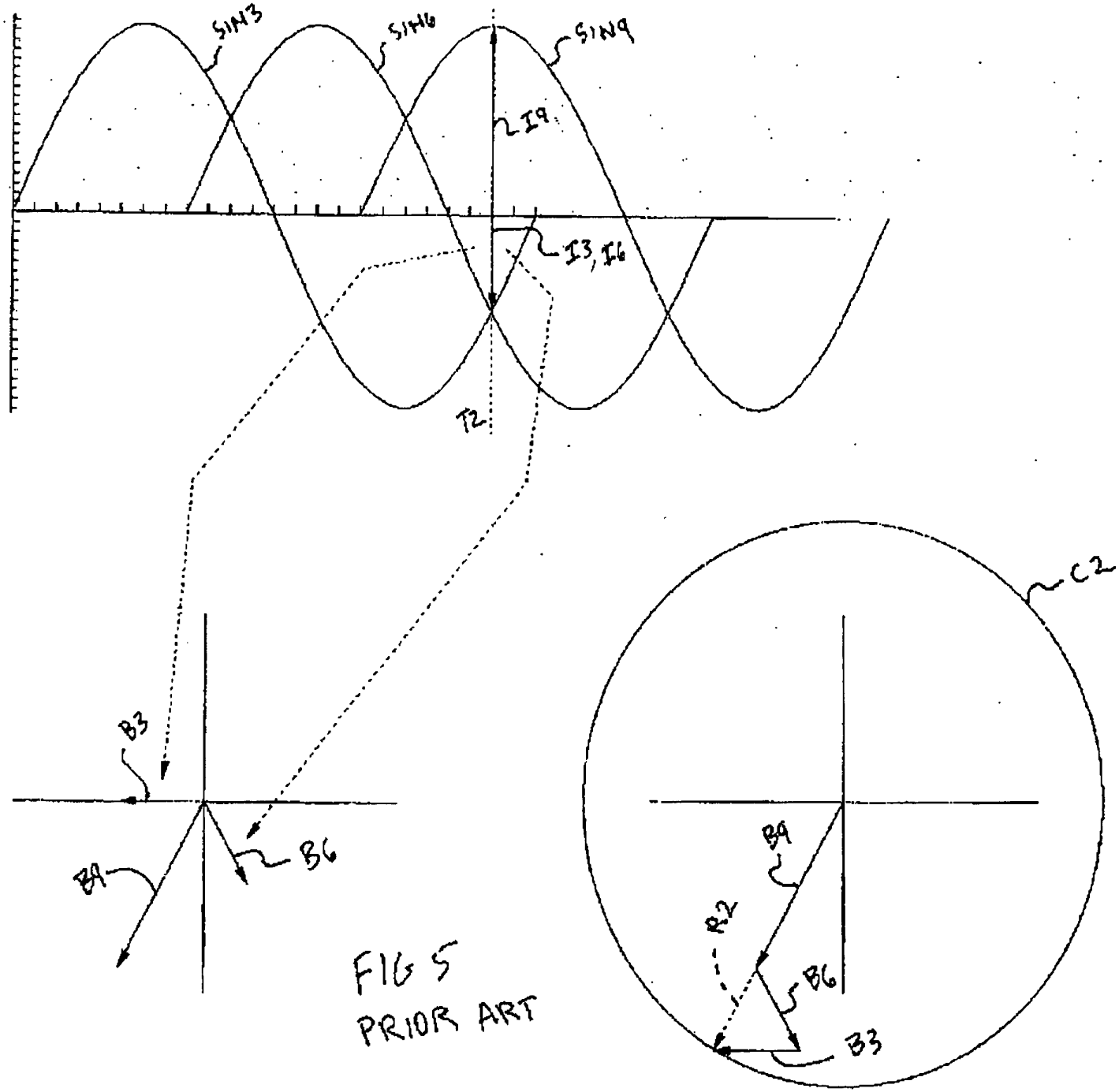


FIG 5
PRIOR ART

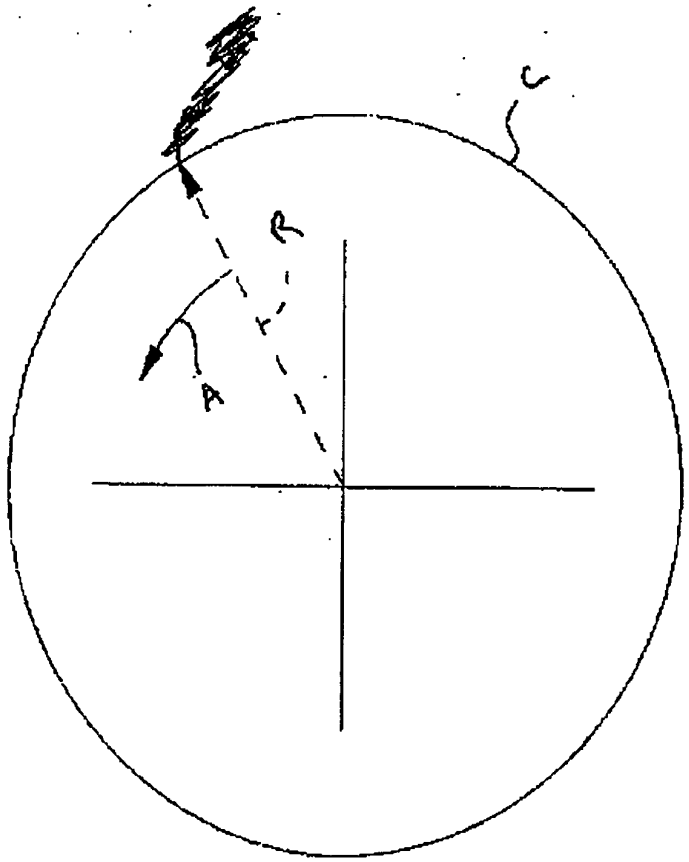


FIG 6
PRIOR ART

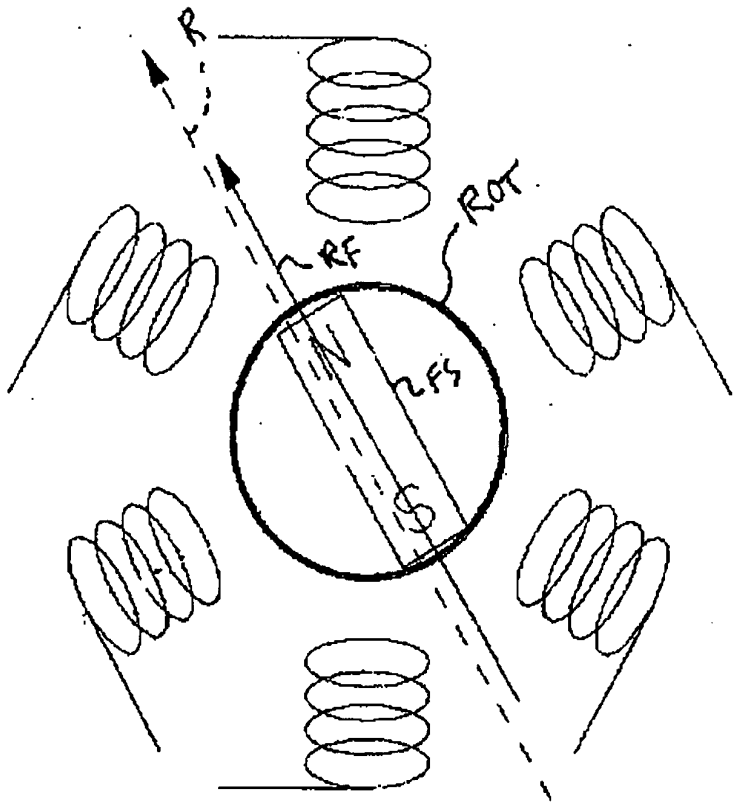
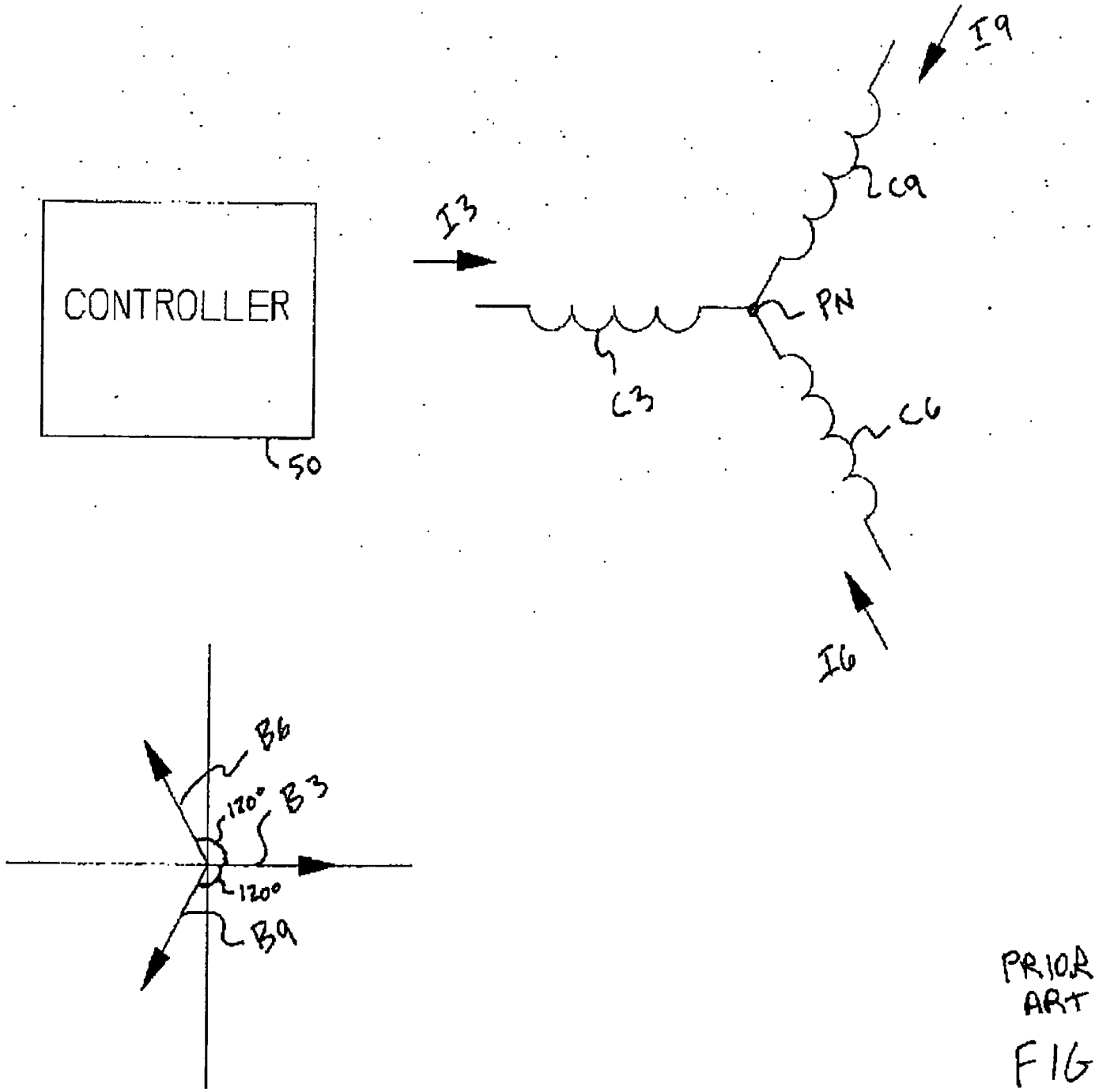


FIG 7
PRIOR ART



PRIOR ART

FIG 8

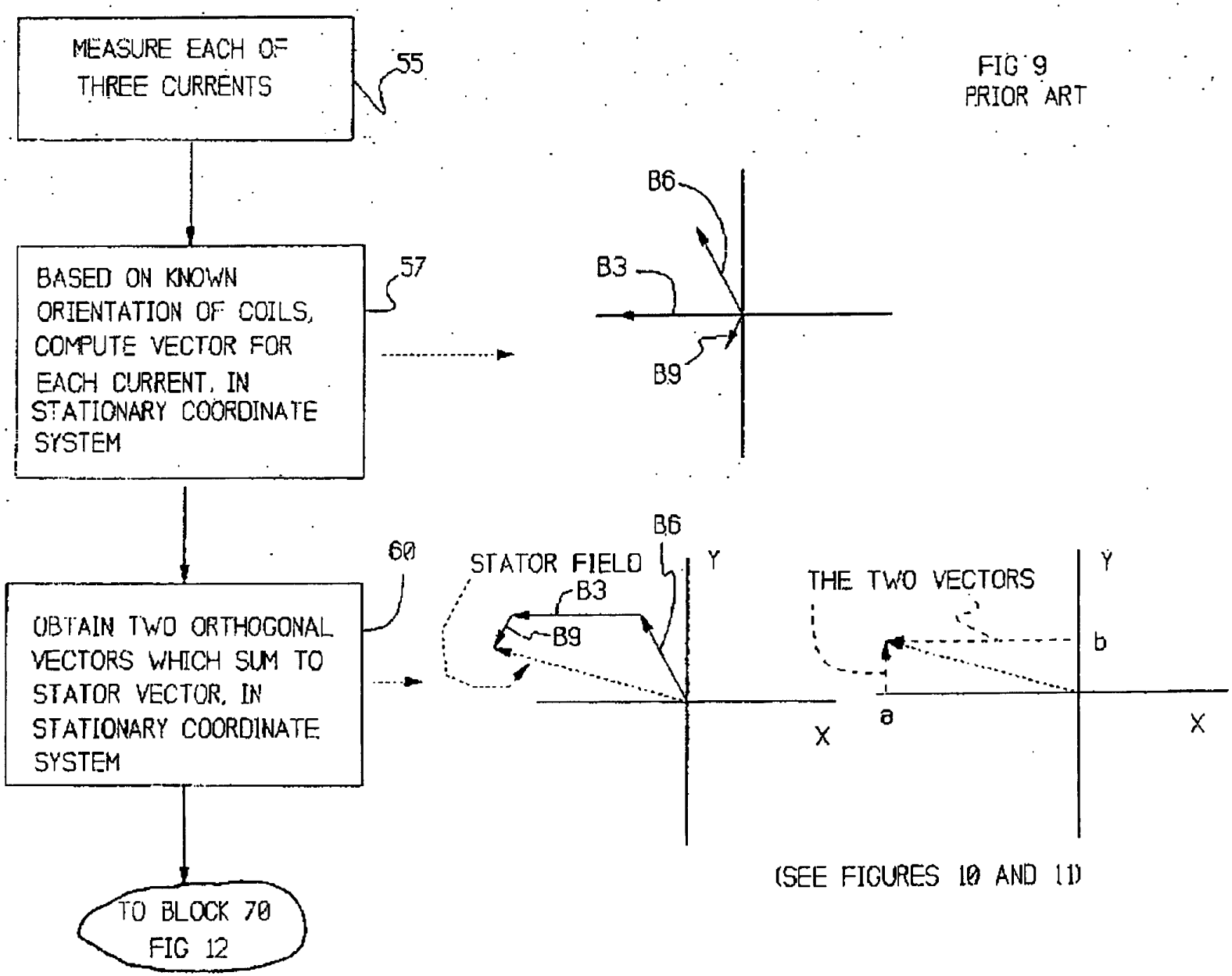
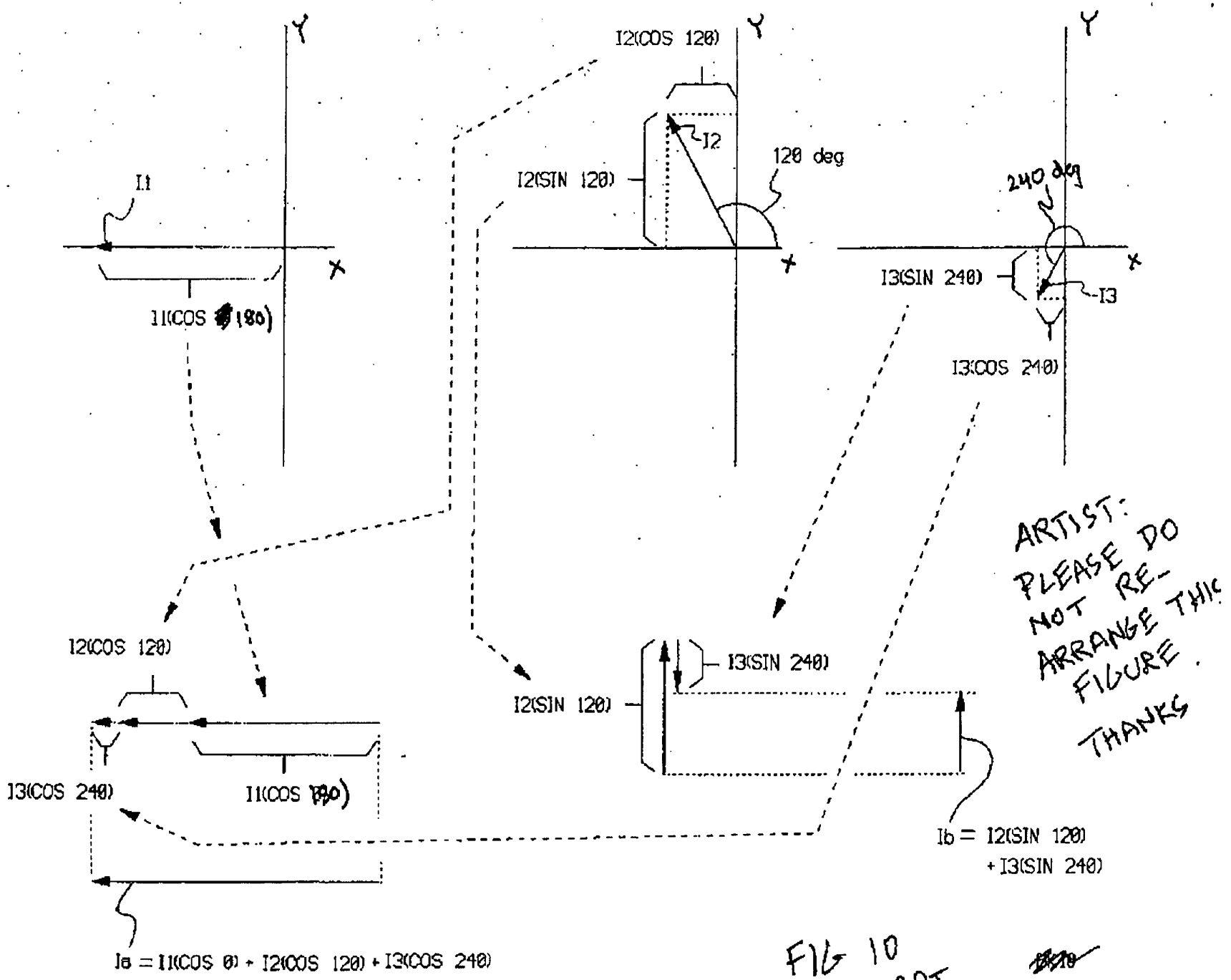


FIG 9
PRIOR ART



ARTIST: PLEASE DO NOT RE-ARRANGE THIS FIGURE. THANKS

FIG 10
PRIOR ART

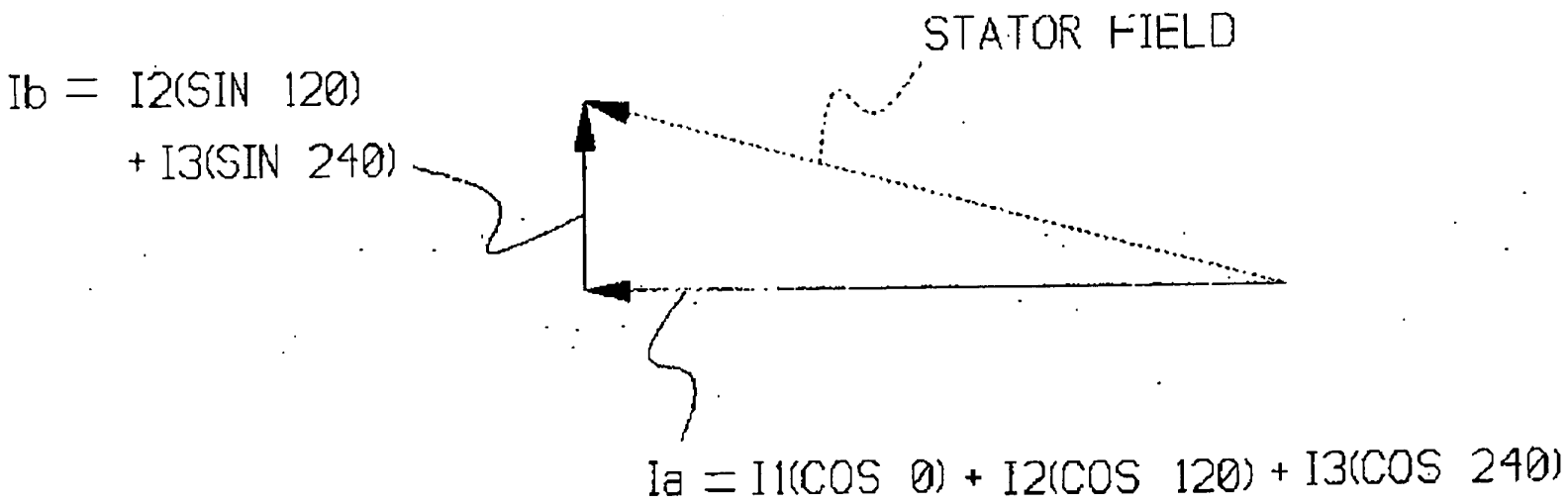


FIG 11
PRIOR
ART

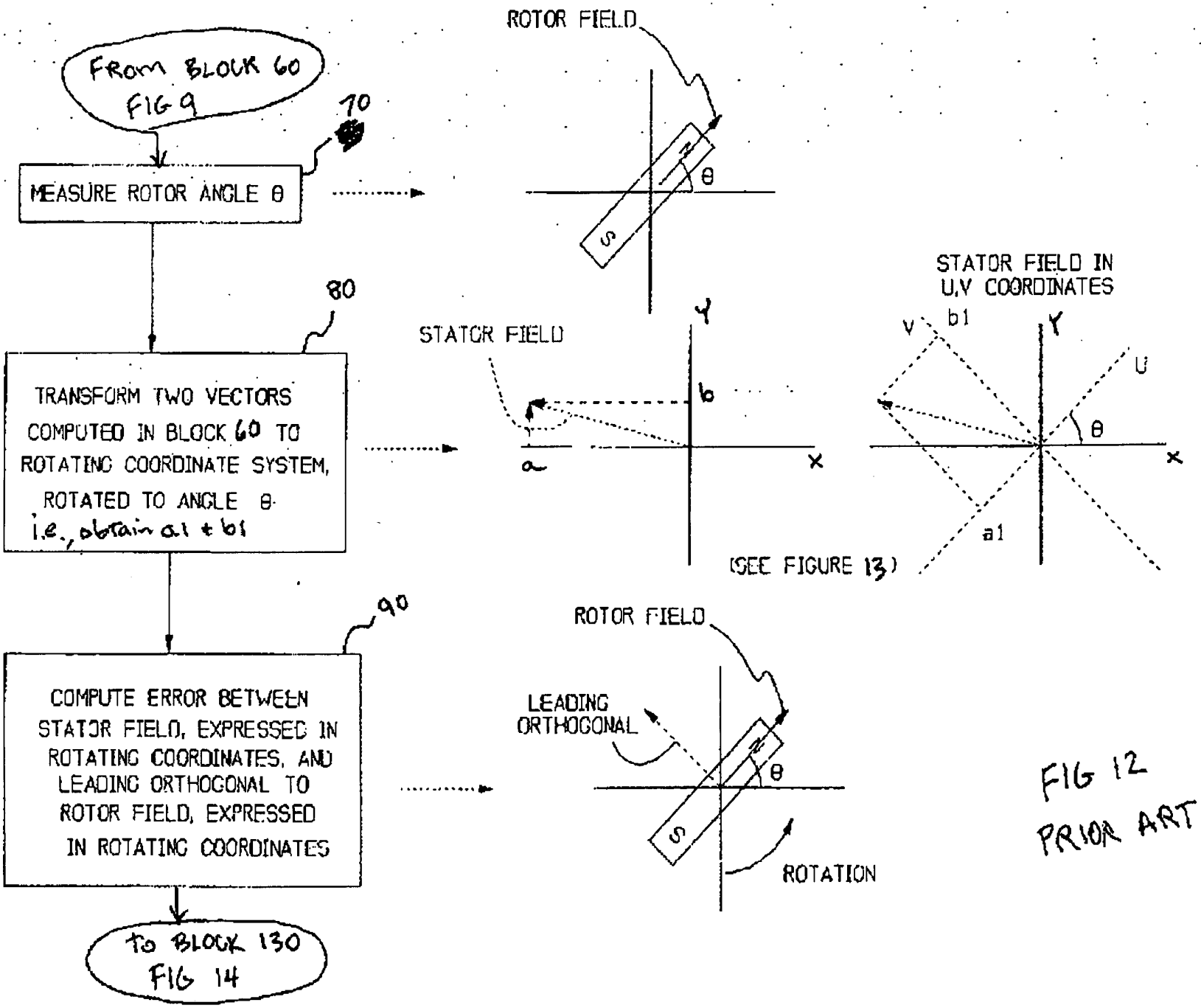
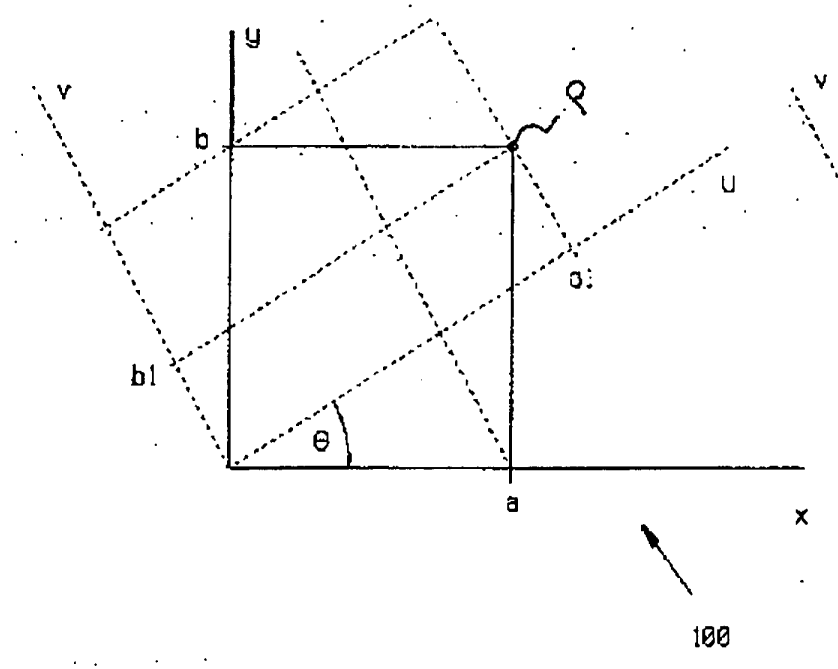
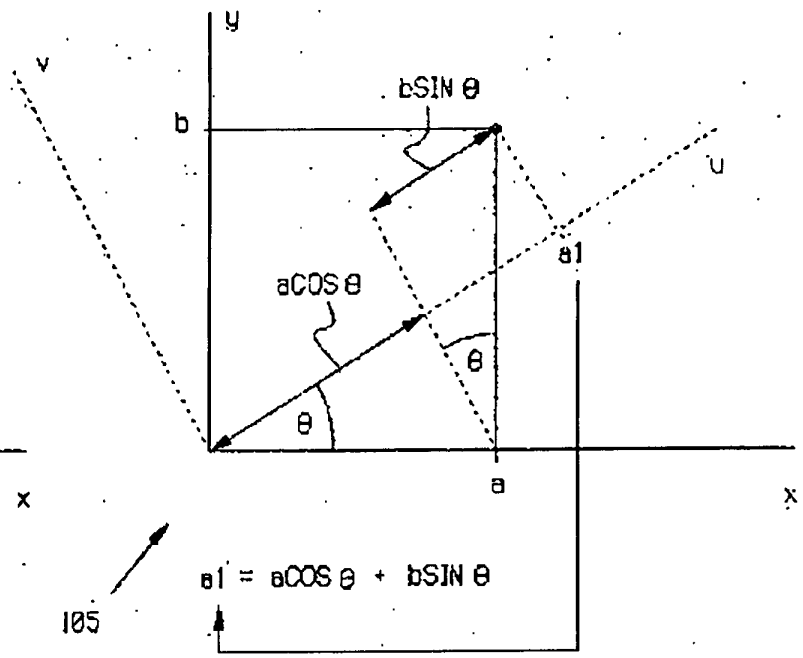
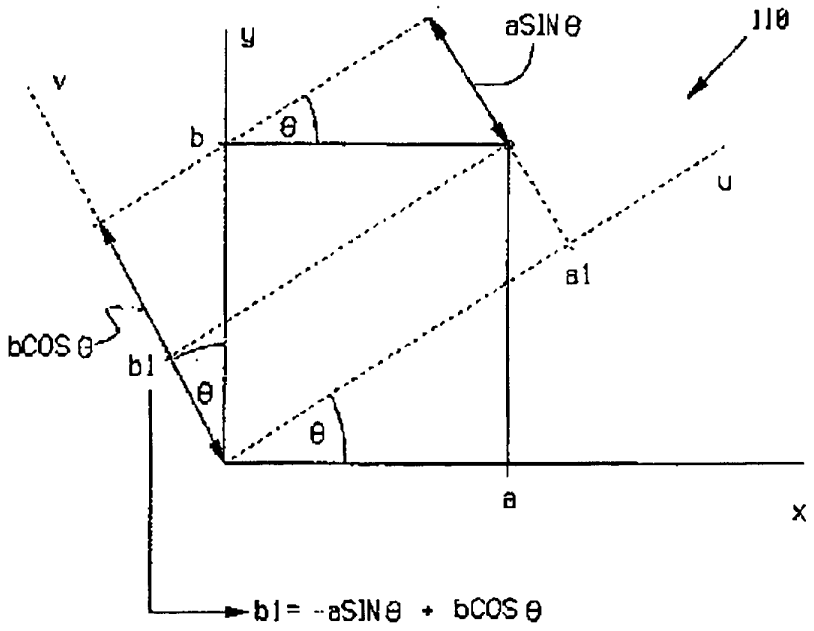


FIG 12
PRIOR ART







115

a1 = aCOS θ + bSIN θ

b1 = -aSIN θ + bCOS θ

FIG 13
PRIOR ART

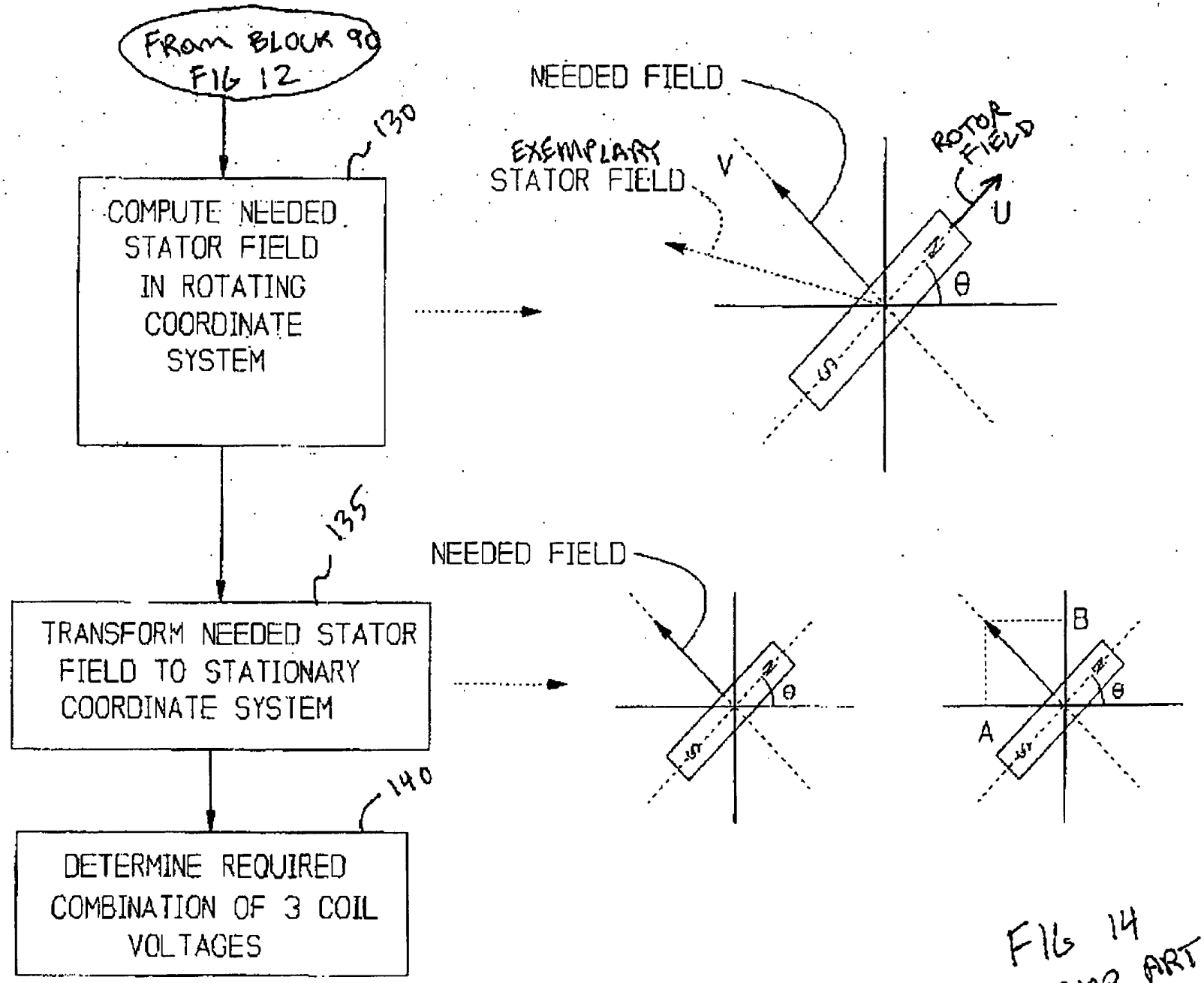


FIG 14
PRIOR ART

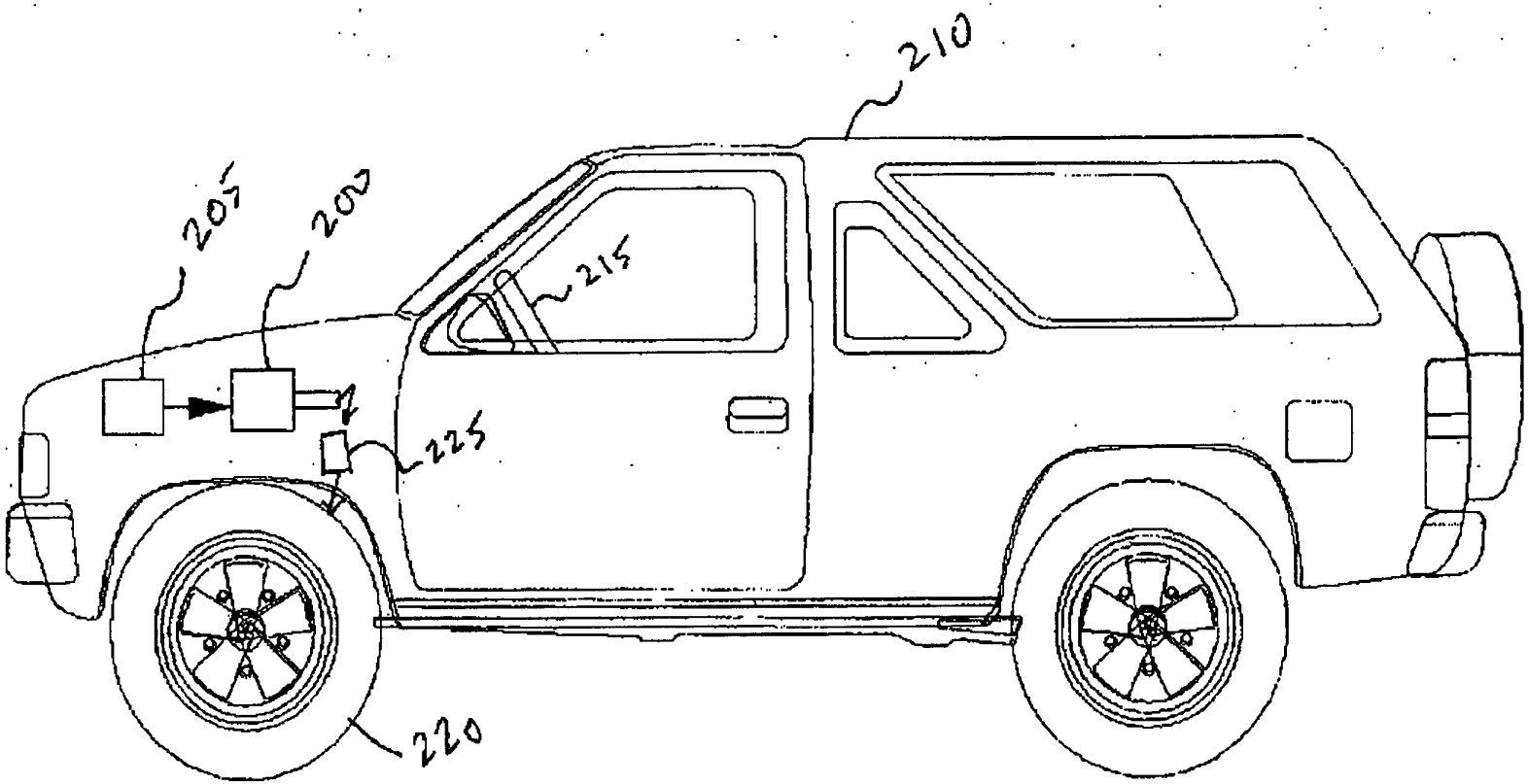


FIG 15

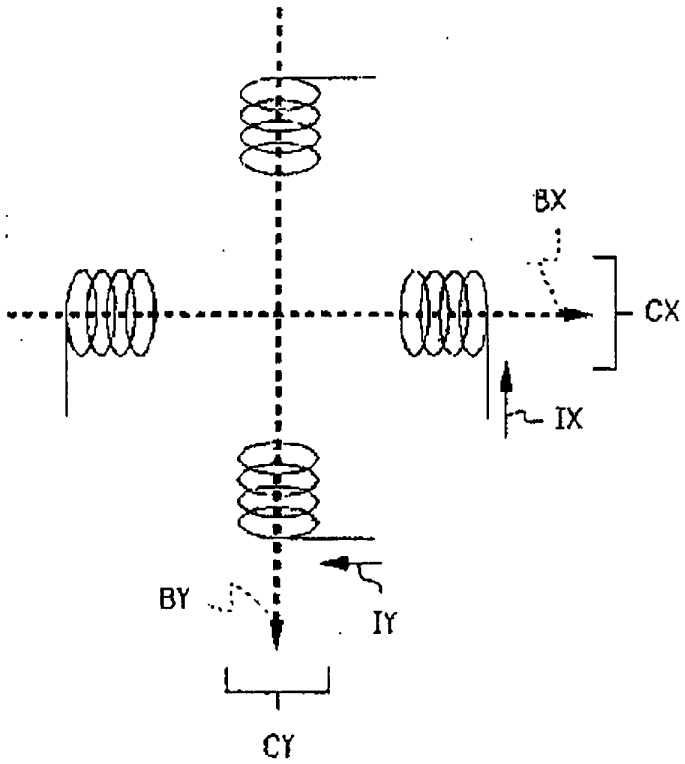


FIG 16

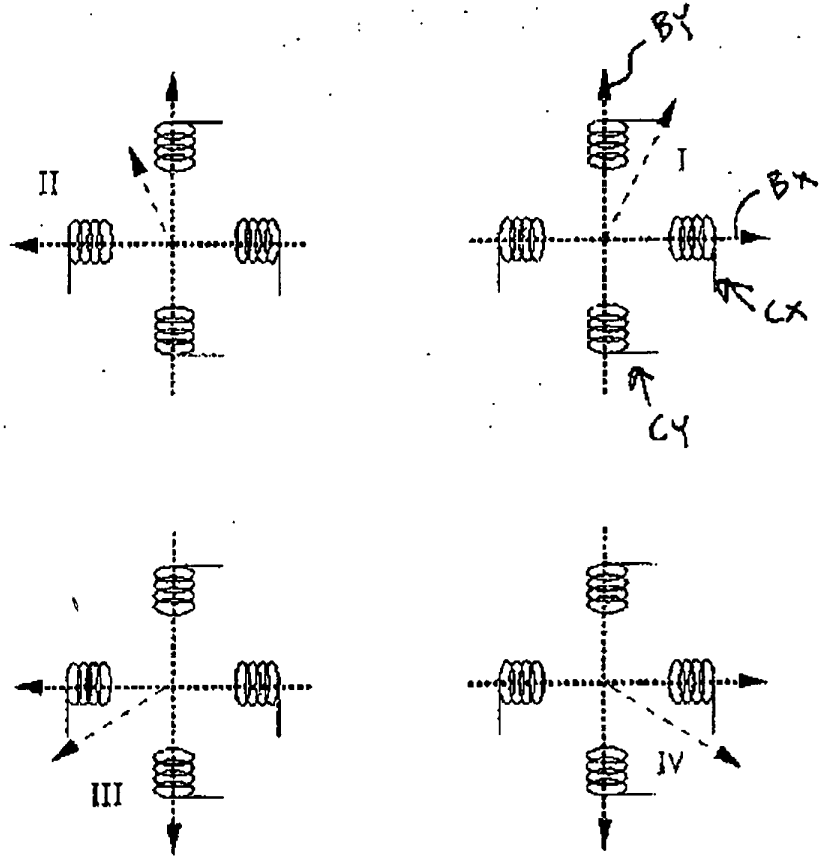


FIG 21

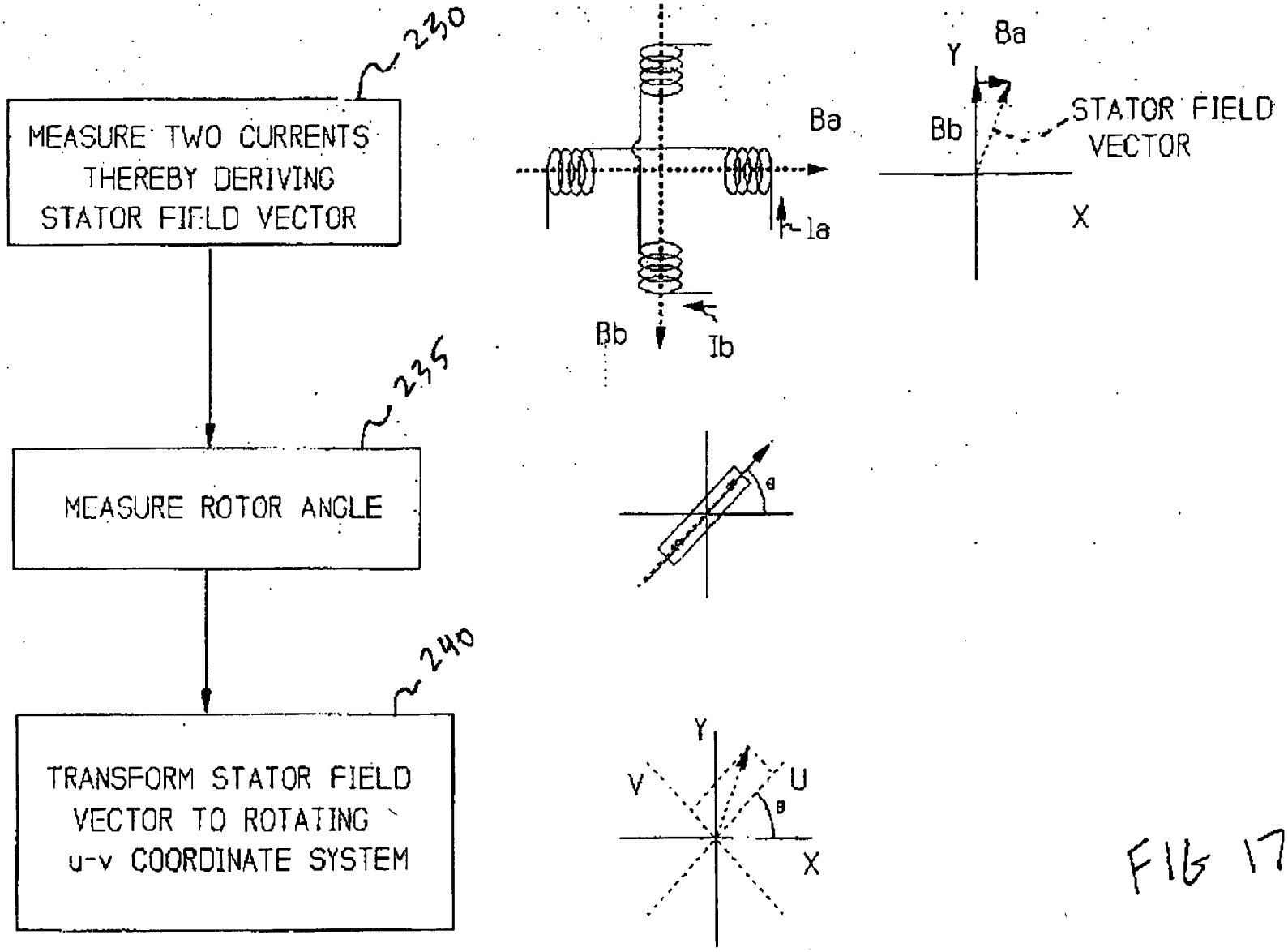

230
MEASURE TWO CURRENTS THEREBY DERIVING STATOR FIELD VECTOR
235
MEASURE ROTOR ANGLE
240
TRANSFORM STATOR FIELD VECTOR TO ROTATING u-v COORDINATE SYSTEM
Ba
Bb
Ia
Ib
Y
Ba
Bb
STATOR FIELD VECTOR
X
θ
Y
V
U
θ
X

FIG 17

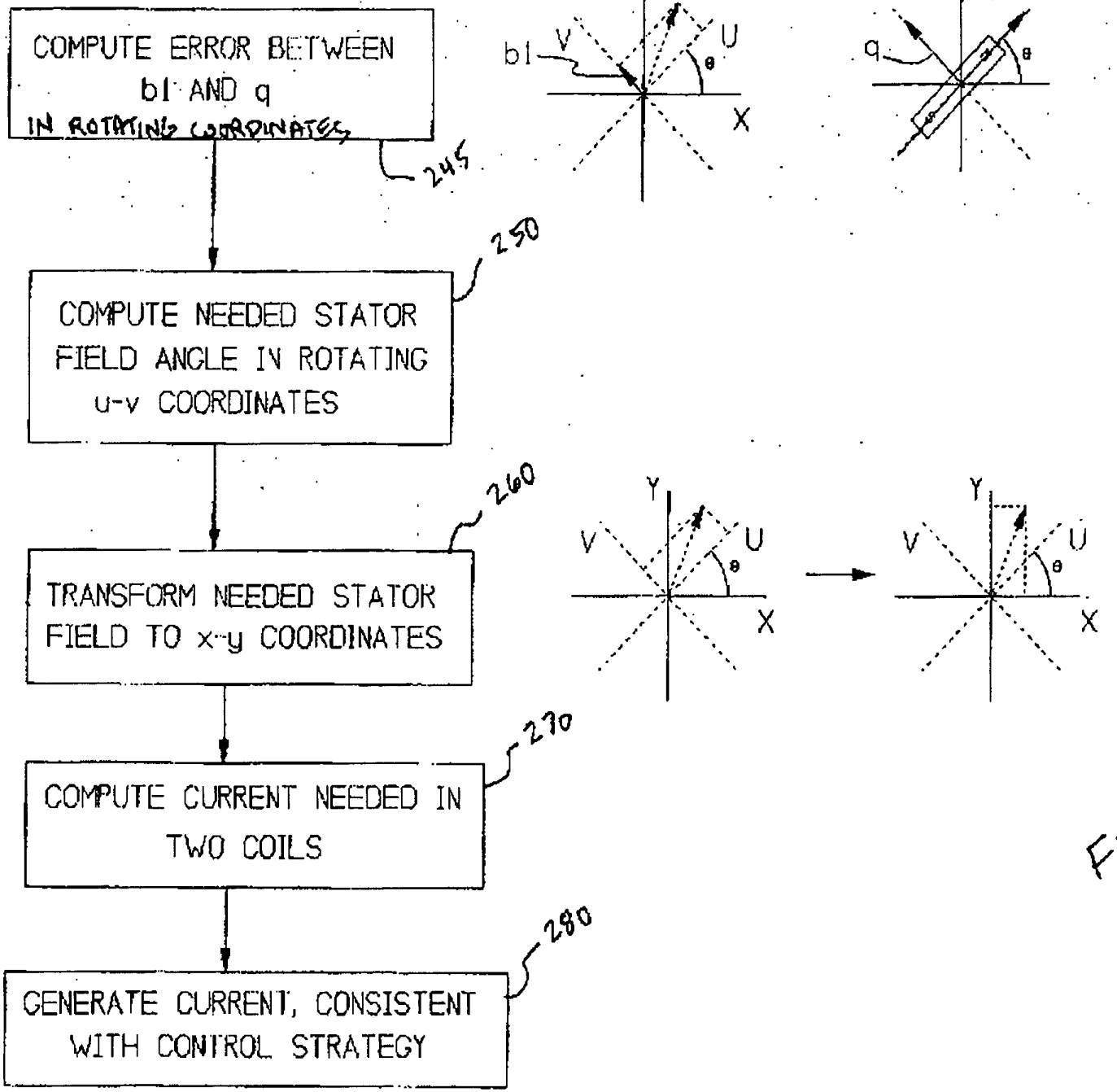

COMPUTE ERROR BETWEEN
bl AND q
IN ROTATING COORDINATES
245
COMPUTE NEEDED STATOR
FIELD ANGLE IN ROTATING
u-v COORDINATES
250
TRANSFORM NEEDED STATOR
FIELD TO x-y COORDINATES
260
COMPUTE CURRENT NEEDED IN
TWO COILS
270
GENERATE CURRENT, CONSISTENT
WITH CONTROL STRATEGY
280
Y
bl
V
U
θ
X
q
θ
Y
V
U
θ
X
Y
V
U
θ
X

FIG 18

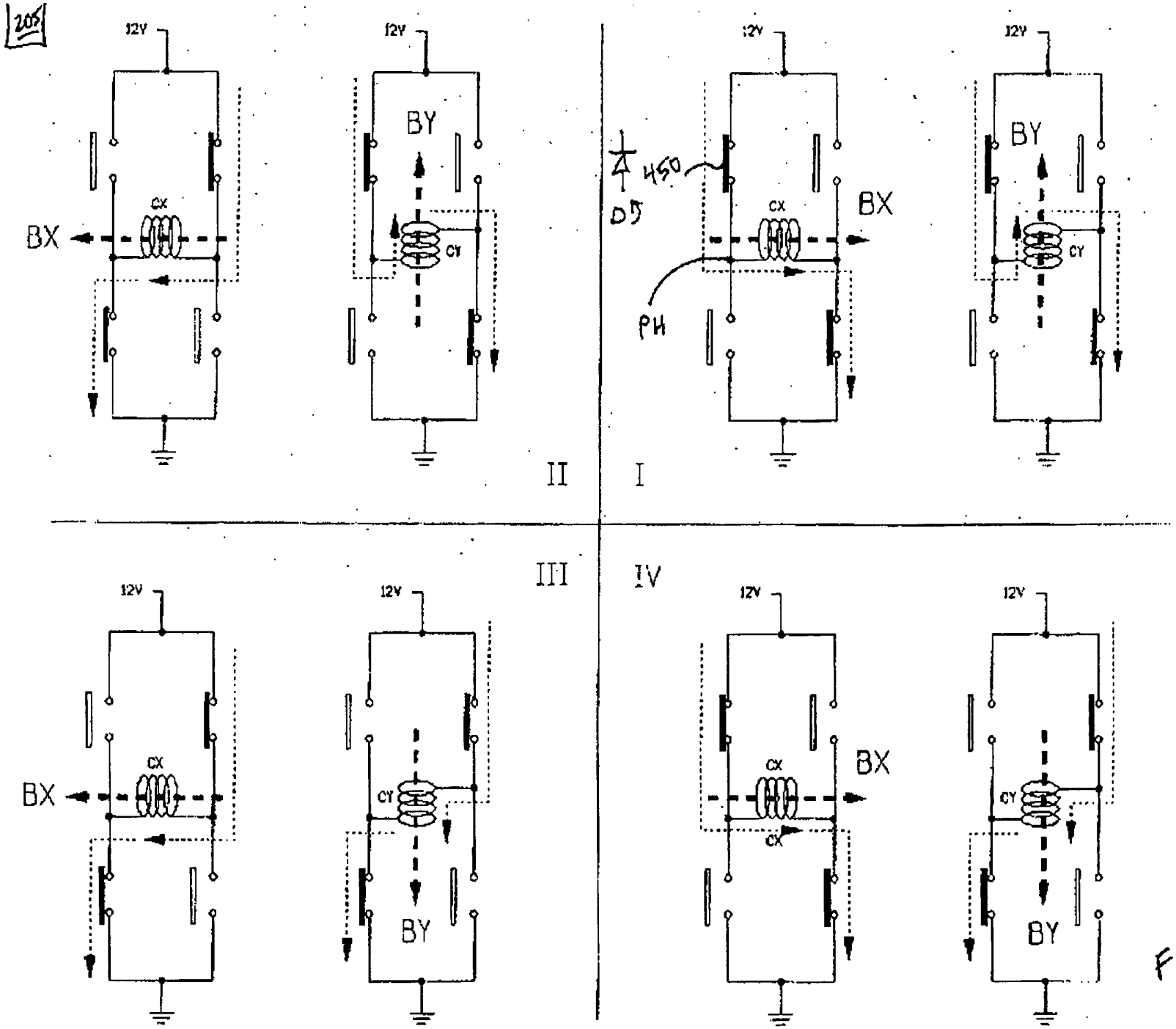


FIG 22

FIG 23

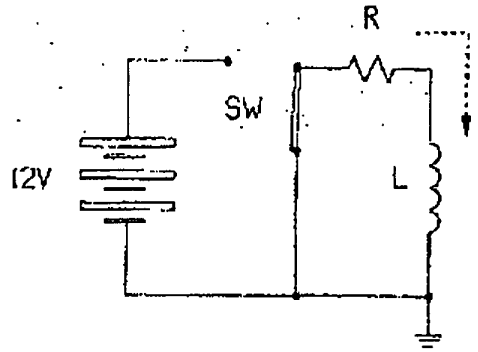


FIG 24

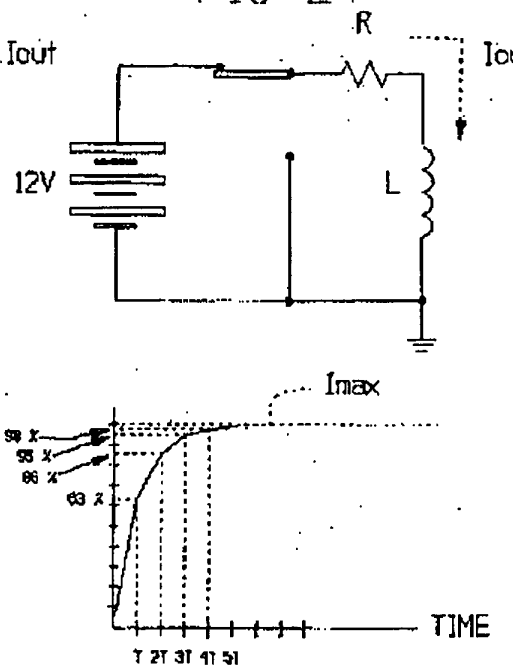
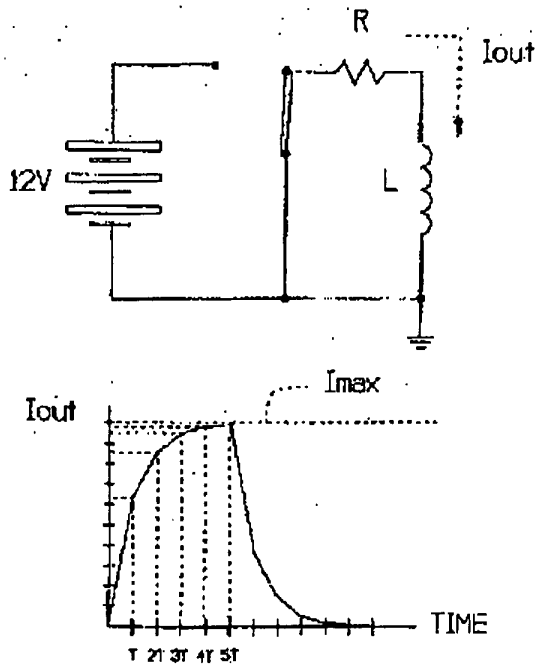


FIG 25



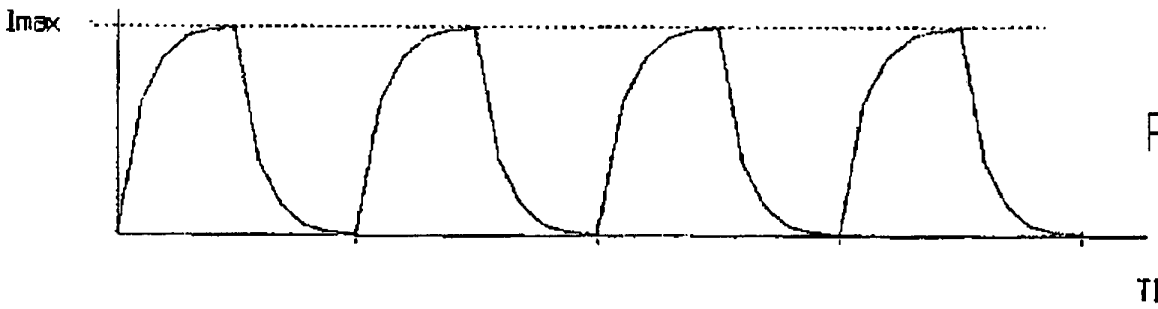


FIG 26

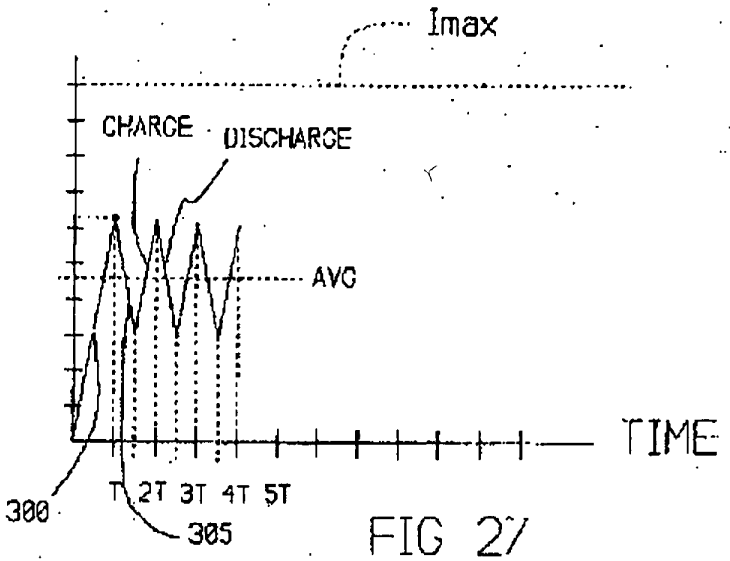


FIG 27

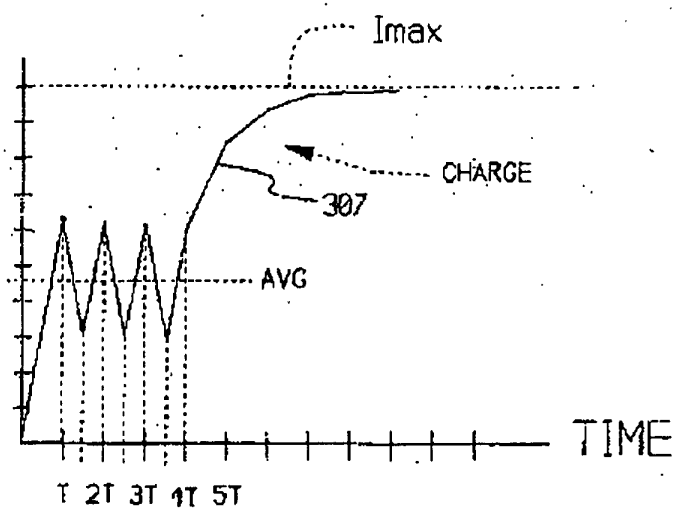


FIG 28

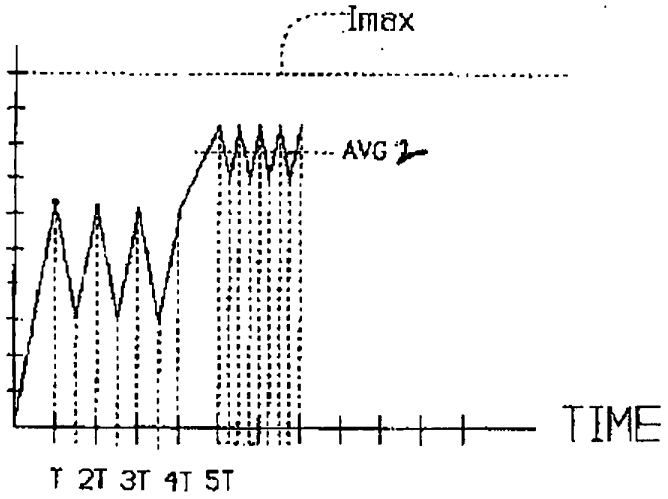


FIG 29

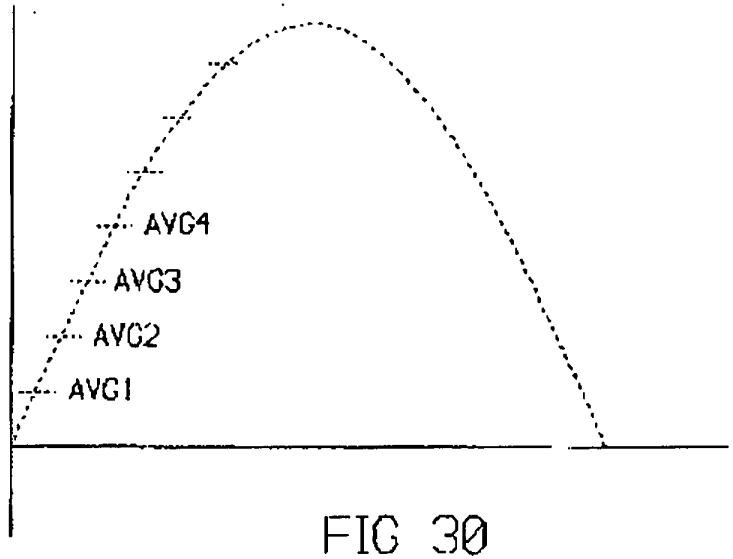


FIG 30

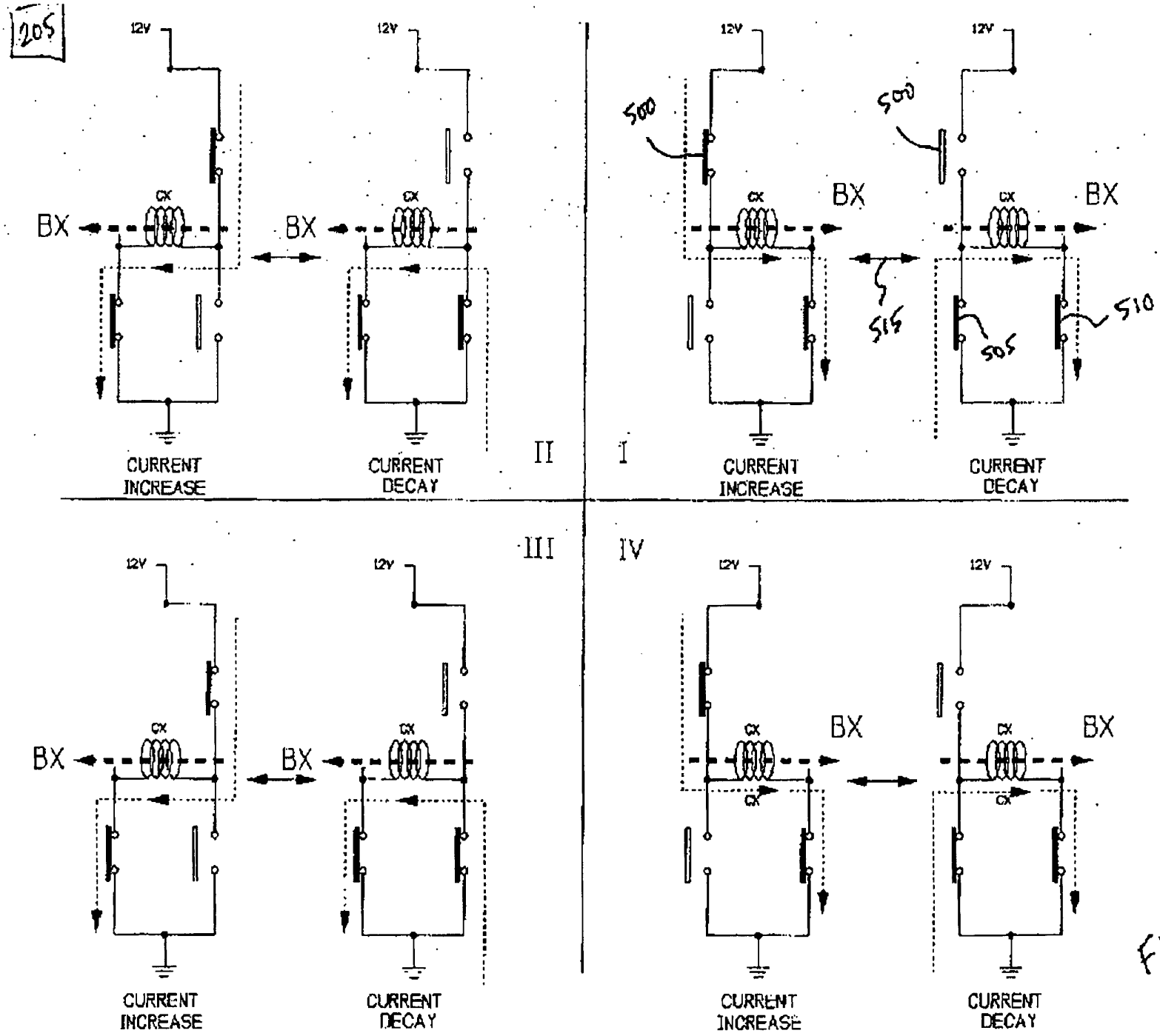

205
12V
CX
BX
CURRENT INCREASE
CURRENT DECAY
II
I
III
IV
500
505
510
515

FIG 31

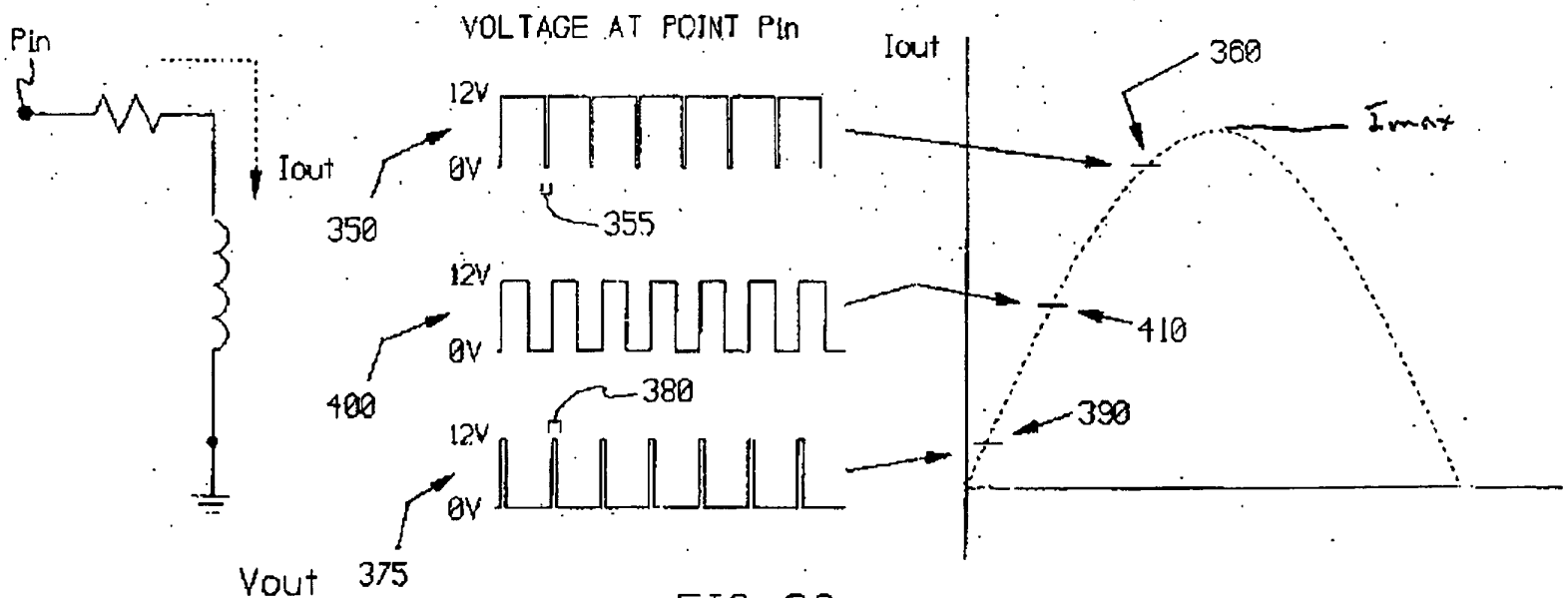

Pin
VOLTAGE AT POINT Pin
Iout
12V
0V
350
355
360
Imax
410
400
380
390
Vout
375

FIG 32

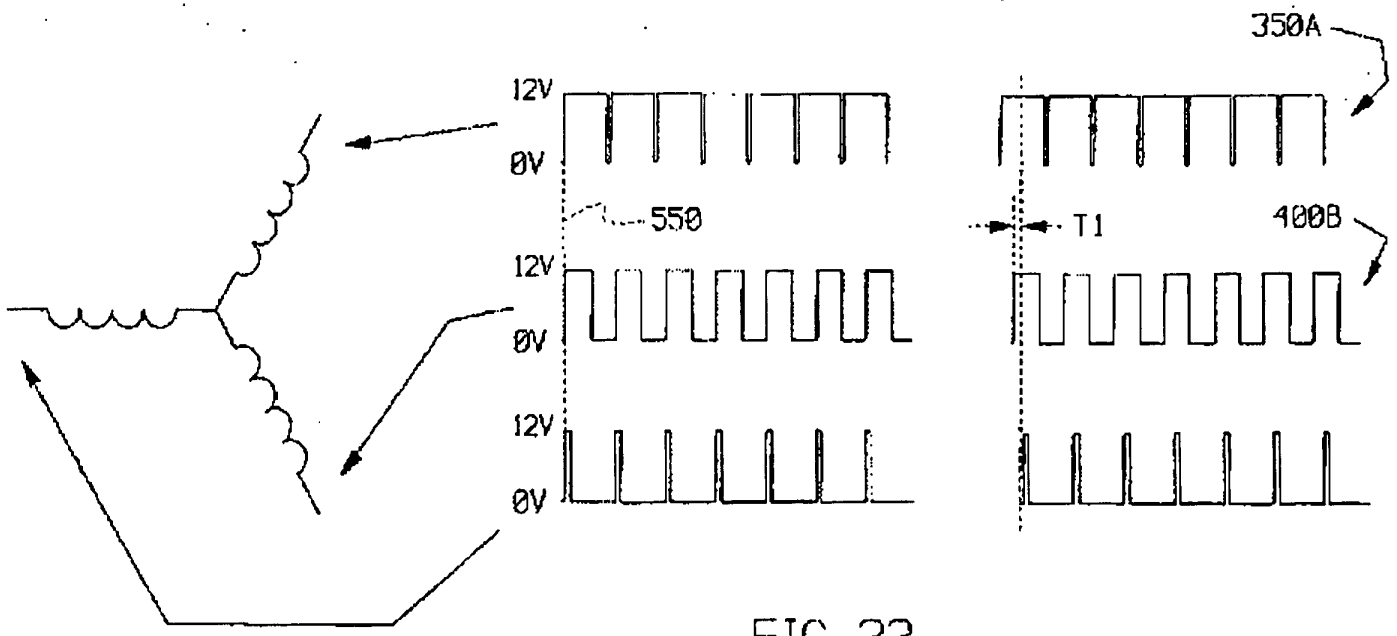

350A
12V
0V
550
T1
400B
12V
0V
12V
0V

FIG 33

Motor Type	Phases	Commutation	Control
Brush DC Motor	3 slots	Mechanical	Open Loop
Permanent Magnet	4 slots		Voltage
Series Wound Field	...		Current
Shunt Wound Field	n slots		Field Control
Compound Wound Field			
Switched Reluctance Motor	1 2 3 4 n	Current regulated Voltage regulated	Open Loop Voltage Current Phase Angle
Induction Motor	1 2 3 n	Sinusoidal space vector Triangle - sine	Open Loop Constant V/Hz FOC
Piezoelectric motor			
BRUSHLESS DC	2	SINE	FOC

INVENTION

FIG 35